Sowing the AI seed for Intelligent Farming

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Artificial Intelligence:

Artificial intelligence leverages computers and machines to mimic the problem-solving and decision-making capabilities of the human mind.

In its simplest form, artificial intelligence is a field that combines computer science and robust datasets to enable problem-solving.

American Computer scientist John McCarthy first introduced the term “Artificial Intelligence” at the 1955 Dartmouth Conference.

Agriculture in India:

India’s Contribution percentage of key foodgrains in acreage terms is 15%, production contribution is 8.7%

Average landholding size in India is about 1 hectare

About 86% farmers are small & marginal who cultivate 47% of India's arable land

About 13% are semi medium farmers cultivating 43.6% of the land

About 0.9% large farmers cultivate 9% of the land

The agriculture and allied sectors grew at a positive growth rate of 3.6 per cent during 2020-21 (Covid Pandemic year)

The share of agriculture sector in total GVA of the economy has a long-term trend of around 18 per cent.

Unique Challenges of Indian Agriculture:

The lack of proper infrastructure and Knowhow

Faith in conventional styles of functioning

Lack of awareness

Scarcity of farmer capital

Fragmentation of Land

Large Scale implementation of new technology not being possible

India account for about 18% of the World population, is expected to surpass China by 2023 to become the World’s most populated country, with this comes the pressure to feed that many mouths

This brings out the practicality of Malthus theory - Malthus stated that population increased in a geometric progression (ie., 2, 4, 16, 132…) while food production increased in arithmetic progression (ie., 2, 4, 6, 8…). Thus population grew faster than food production and tended to outstrip it in a short time.

An ICAR estimation shows that by 2030 the demand for pulses, cereals, rice, eggs, fruits, vegetables and milk would be more than twice than that was in 2000 while the demand for food grains would jump by more than 85%.

Advantages of AI in Agriculture:

AI has the potential to add $1 trillion to India's economy. India's agritech market is estimated at $204 million. In this scenario, let us understand the advantages of AI in agriculture

(i) Maximizing Profits: Efficient and Cost effective resource and yield management. With the output yield estimates and price forecasts will help farmers obtain maximum profits.

This is directly correlated with the Government's aim to double the farmers income by 2022-23 and also to reduce the instances of rural poverty, seasonal and disguised unemployment

(ii) Proper use of Herbicides - It can help farmers through precision farming – This can help farmers detect crop diseases, pests and malnutrition in fields and can help farmers determine whether pesticides and weedicides to be used by detecting and targeting weeds in the identified buffer zones. Thus it prevents over use or under use of herbicides.

(**iii) Disaster Mitigation -** It enables farmers to extract and analyse weather information such as weather, temperature, water consumption or soil conditions through data collected directly from their fields. Thus it can mitigate the loss that the farmers is likely to face due to changes in weather conditions

(iv) Reducing Wastages – AI driven robots can be used to harvest huge volumes faster; be trained on data for specific crop variety, weather condition & location, taking into consideration byproducts to reduce wastages.

(v) Higher Yield - It helps farmers in developing seasonal forecast models to improve farming accuracy, along with that AI can help monitor crop health, diagnose soil defects and nutrient deficiency on a real time and predictive basis aiding farmers obtain highest possible yields

(vi) Reduces the instances of Cobweb phenomenon - Cobweb phenomenon is where the prices of certain goods witness fluctuations that are cyclical in nature. It happens due to faulty producer expectations. AI has the potential to address this issue by providing the real time supply-demand mismatch.

Challenges for Adopting AI in Agriculture:

(i) Policy Upgrade: Yet-to-mature data governance and data rights regime. Lack of enforcement of data regulations, privacy and transparency

(ii) Trust Deficit & Handholding Gaps: Risk-aversion and resistance to change, lack of trust in technology and insufficient support of universities and academics in data digitisation and digital agriculture

(iii) Language, Literacy: Language barrier, including high illiteracy rates, and the digital divide. Lack of formal, non-formal and informal education in data engineering, data analysis and data science and insufficient proficiency

(iv) Tech, Connectivity: Lack of supporting ICT and data infrastructure. Deficient telecommunication networks and poor internet connectivity. Irregular and erratic electricity supply

(v) Data: Limited access to cloud hosted data, fragmentation of data and lack of data standards

(vi) Finance & Investing: Insufficient capital to invest in ICT devices and data infrastructures, insufficient finance for maintenance of existing infrastructures, lack of public investment to bridge gaps in data engineering, data analysis and data science education. Lack of awareness and clarity regarding return on investment in Al systems, and no financial assistance schemes for small farms to adopt and deploy ICT devices and embedded systems

Various Initiatives:

NITI Aayog unveiled its National Strategy on AI #AIForAll in 2018 which aims to guide research and development in new and emerging technologies. NITI Aayog has identified five sectors — healthcare, agriculture, education, smart cities and infrastructure and transportation — to focus its efforts towards implementation of AI.

Uttar Pradesh is collaborating with the Bill and Melinda Gates Foundation (BMGF) and the Tata Trust to set up the Indian agritech incubation network at IIT-Kanpur

Maharashtra has launched the Maha AgriTech project that is aimed at utilising and promoting the application of satellites and drones to solve various agrarian problems.

Punjab's initiative to enable traceability in the potato seed supply chain and pre-immunise it

The Telangana government launched the Artificial Intelligence for Agricultural Innovation (AI4AI) programme in collaboration with the Centre for the Fourth Industrial Revolution, India (C4IR), World Economic Forum.

Conclusion:

With the right mix of participation from public and private institutions, AI soon prove to be a boon to the agricultural sector, not just in India but worldwide and can help ensure food security for all.